From Tunnel Vision to VIEWS Vision...

The VIEWS Corridor advances the ASCI "see and understand" mission to new levels of clarity and collaboration

Imagine conducting a geological survey of the Grand Canyon by peering through a small tube. While the very notion seems ludicrous, it is actually comparable to studying multi-terabyte scientific data sets in the tunnel vision environment of a computer monitor.

Leveraging the concept of massively parallel processing supercomputing systems, Sandia's data analysis and visualization team has created an extraordinarily innovative viewing environment —the VIEWS Corridor. VIEWS, an acronym for Visual Interactive Environment for Weapons Simulation, is an ASCI subprogram whose goal is to develop infrastructure known as Data and Visualization Corridors (DVC) that connect supercomputers with ASCI users. The DVC concept depicts a wide path through which massive quantities of data easily flow. Sandia's VIEWS Corridor encapsulates this vision.

The goal was not just to expand the data visualization window but also to create a multi-media experiential environment with a scalable multi-million-pixel display producing as clear an image as human vision can perceive, and to do it economically. The heart of VIEWS is a massively parallel imaging system capable of mirroring the scale of the massive data sets used for the modeling and simulations of weapons engineering, homeland security, biotechnology and weather. Using core technology from the computer game

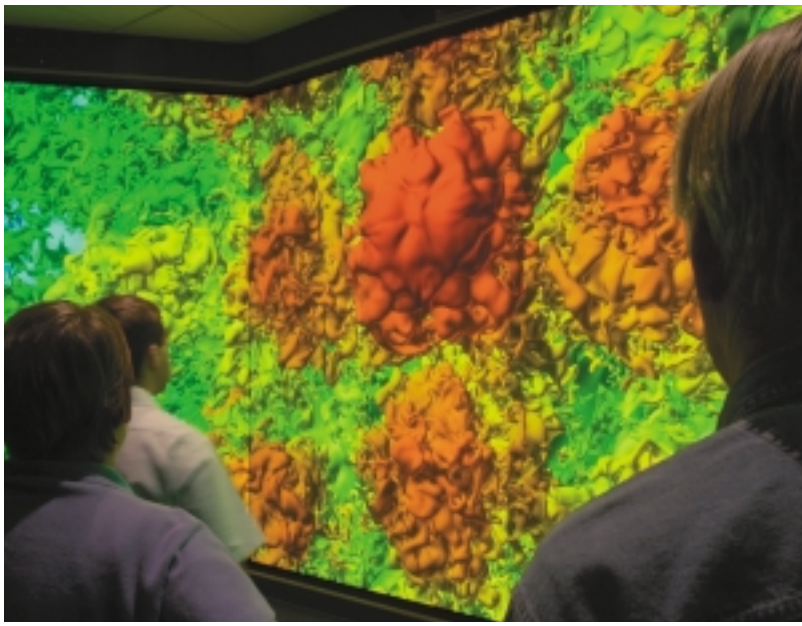
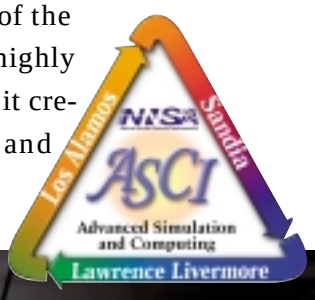


Figure 1. They will come. The 62 MegaPixel resolution VIEWS display draws viewers to step up for a closer look at critical details. Here, viewers gather to examine turbulent plumes in the scientific visualization of an isosurface between an oil/water mixture.

market, 64 off-the-shelf PCs equipped with the most advanced graphics cards drive 48 projectors, creating both a scalable graphics rendering cluster and a scalable high-resolution display.

The model of scalable rendering and scalable display technology saved both time and money in the quest to set new standards for viewing the results of complex scientific simulations. Commercial graphics super computers would have cost as much as six times more than the off-the-shelf PC render cluster, and often take hours to process a single frame.

While the technical and economic achievements of VIEWS Corridor are important, the overarching success is the richness of the visual experience and the highly collaborative environment it creates. Once obscure details and the fuzzy cell boundaries



seen on a conventional display are crystal clear with crisp definition.

As the success of the VIEWS Corridor grows it will create new data visualization and problem-solving opportunities in other fields such as microsystems, nano and biotechnology with benefits propagating to the private sector.

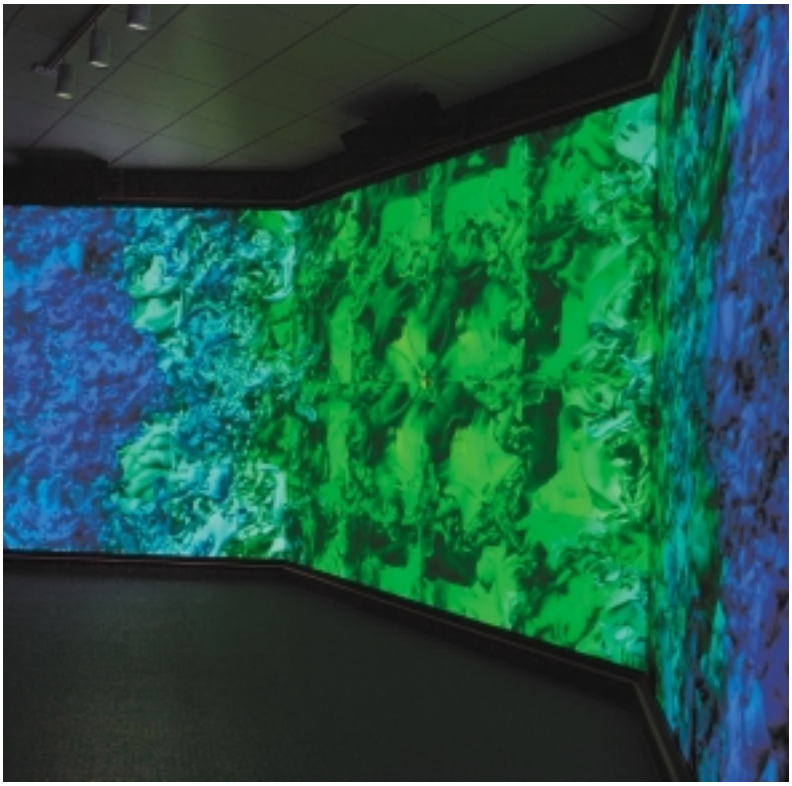


Figure 2. The VIEWS Corridor's massive display system consists of an array of 3 floor-to-ceiling screens illuminated from the rear by 48 digital projectors.

Technical Details

The VIEWS display system is an array of 48 (12 wide by 4 high) digital projectors arranged behind a 3-section rear projection screen. Each screen section is 12.7ft wide by 10.2ft high. They are joined at 45° angles to form a continuous 38.1ft by 10.2ft screen. The custom manufactured screens are constructed of 0.5in thick glass coated with a proprietary optical imaging surface. Each projector is a high brightness (~3500 Lumen) 3-chip digital micro-mirror technology device (DLP ™). The individual projector resolution is 1280 pixels by 1024 pixels. Projectors are precision aligned (to within ±0.75mm) and abutted to provide over 62 MegaPixels (48×1280×1024) of combined precision display resolution.

The VIEWS scalable computer cluster consists of 64 Compaq SP750's, each equipped with a commodity high-performance NVIDIA gaming graphics adapter and configured with a Myrinet high-speed communications interconnect. 48 of the machines are connected to directly drive a display projector with RGB video. Sources other than the local cluster may also be configured to drive the display array, including non-local scalable rendering clusters and a variety of external sources such as PC's, laptops, VTR and DVD decks, and video sources supporting Video Teleconferencing. A variety of custom and commercial software is available to generate and composite application data for the display. Some of the application and library software was custom developed under contract to ASCI to enhance performance and capability for scalable rendering and multi-tile display.

For more information on the ASCI VIEWS Corridor at Sandia National Laboratories,please contact Philip Heermann, pdheerm@sandia.gov, or Constantine Pavlakos, cjpavla@sandia.gov.

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